

# Clinical Outcome of Total Scapulectomy in 10 Patients with Primary Malignant Bone and Soft-Tissue Tumors

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**Background and Objectives:** Limb reconstruction after total scapulectomy for malignant bone and soft-tissue tumors around the scapula is difficult. This study was undertaken to clarify the clinical results of total scapulectomy in patients with malignant bone and soft-tissue tumors around the shoulder girdle in our institute between 1984 and 1998.

**Methods:** Ten patients undergoing total scapulectomy had an age range of 12–82 years (average = 56 years). There were 5 cases of bone tumor and 5 cases of soft-tissue tumor. The follow-up period ranged from 8 months to 13 years 5 months.

**Results:** Seven patients are currently alive; the remaining 3 patients died of other diseases. One case of local recurrence was detected. The 2-year survival rate of all cases was 78.8%, and the 5-year survival rate was 52.5%. The average function evaluated by Enneking's criteria was 64.6%. Although the range of motion in the shoulder joint was seriously limited in all patients, the elbow and hand functions were almost normal. Recently, we have used a bone-anchoring system to suture between the clavicle and muscles, including the biceps, triceps, and deltoid muscles.

**Conclusions:** Patients who undergo total scapulectomy may achieve much better upper limb function than those who undergo forequarter amputation (interscapulothoracic amputation).

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**KEY WORDS:** scapulectomy; bone and soft-tissue neoplasms; limb salvage; functional evaluation

## INTRODUCTION

Total scapulectomy is rarely performed for resection of malignant bone and soft-tissue tumors around the scapula. Reconstruction of the shoulder girdle after total scapulectomy is difficult. This study was undertaken to clarify the clinical outcome of intraarticular total scapulectomy in 10 patients with malignant bone and soft-tissue tumors around the shoulder girdle.

## MATERIALS AND METHODS

### Patients

The patients ranged in age from 12 to 82 years (average = 54 years). Four were male and 6 were female.

There were 5 cases of bone tumor (4 chondrosarcomas and 1 malignant lymphoma) and 5 cases of soft-tissue tumor (3 leiomyosarcomas and 2 malignant fibrous histiocytomas [MFH]). The follow-up period for all cases ranged from 8 months to 13 years 5 months (average = 4 years). The tumor locations in all cases are shown in Figure 1. In all cases, preservation of the shoulder joint was considered impossible because the tumors diffusely

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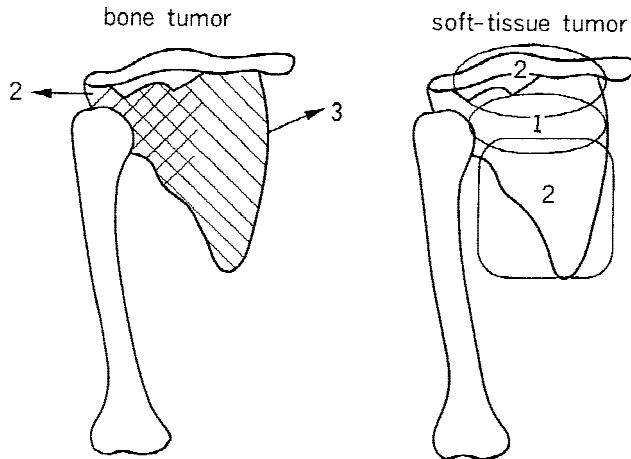


Fig. 1. Tumor locations of all cases.

invaded the entire scapula or arose near the shoulder joint.

### Resection

A patient was placed in the lateral decubitus position. An elliptical skin incision encompassed the tumor and extended from the tip of the acromion superolaterally to the vertebral region inferomedially. The trapezius, deltoid, levator scapulae, rhomboid major, and rhomboid minor muscles were divided and retracted. Then the teres major and minor muscles and triceps, followed by the supraspinatus, infraspinatus, and subscapularis muscles and the attachment of serratus anterior muscles, were divided. The descending scapular and suprascapular arteries and nerve were identified and divided. The acromioclavicular ligament, coracoclavicular ligament, biceps, coracobrachialis, and pectoralis minor muscles were divided. Then the whole scapula was removed.

### Reconstruction

After proper hemostasis was achieved, the remaining muscular tendinous insertions of the humerus were sutured to the residual muscles of the chest wall and clavicle, which were augmented by an artificial ligament or polyethylene thread. Recently, we have used a bone-anchoring system to suture between the clavicle and muscles, including the biceps, triceps, and deltoid muscles (Fig. 2).

### Postoperative Rehabilitation

The Velpeau dressing was removed within 48 h, and a triangular sling was applied. Active and passive exercises of the wrist and elbow were started as soon as possible. Active and actively assisted exercise of the shoulder was started at 4 weeks after surgery. At 6 weeks after surgery, the sling was removed and all motions at the shoulder,

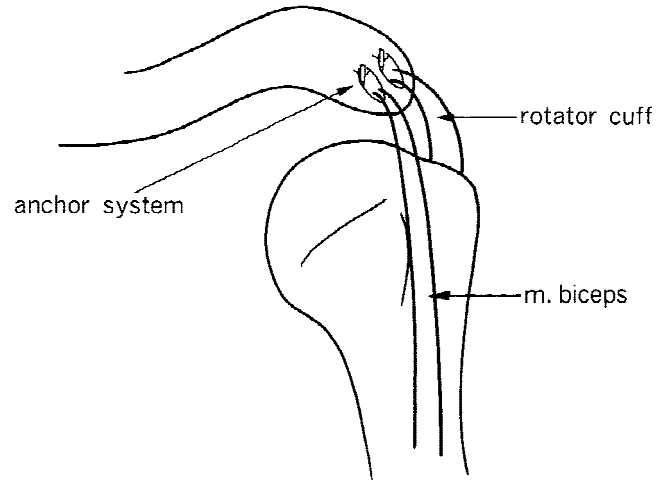


Fig. 2. Reconstruction technique of the shoulder using a bone-anchoring suture system.

elbow, wrist, and finger were allowed. Lifting weight <2 kg was also allowed.

### RESULTS

Seven patients are currently alive; the remaining 3 patients died of other disease: leukemia (case 2), brain infarction (case 4), and renal failure (case 5). One case developed local recurrence due to inadequate tumor resection (case 1). The 2-year survival of all cases was 78.8%, and the 5-year survival was 52.5%. The average function evaluated by the criteria of Enneking et al. [1] was 64.6% (Table I). Although the range of motion in the shoulder joint was seriously limited in all patients, the functions of the elbow and hand were almost normal. Most patients could lift 5 kg of weight. To improve the cosmetic results, 1 girl (case 1) received a pedicular musculocutaneous graft of the latissimus dorsi after total scapulectomy (Figs. 3–5).

### DISCUSSION

Total scapulectomy, first described by James Syme in 1856, is a rarely performed procedure for diseases arising around the scapula [2–7]. Total scapulectomy is indicated for malignant bone tumors of the scapula that invade near the glenoid cavity and for soft-tissue tumors around the scapula that invade the glenoid cavity. In such cases, it is difficult to preserve the shoulder joint [8]. Contraindications include tumors involving the neurovascular bundle or chest wall. The major problems after total scapulectomy are shoulder joint dysfunction and poor cosmetic results. A musculocutaneous flap of the latissimus dorsi is effective to cover large musculocutaneous defects and to improve the cosmetic results, but it is not markedly effective for reconstruction of muscular function. Shoulder joint reconstruction involves a hanging procedure to the clavicle by soft-tissue reconstruction

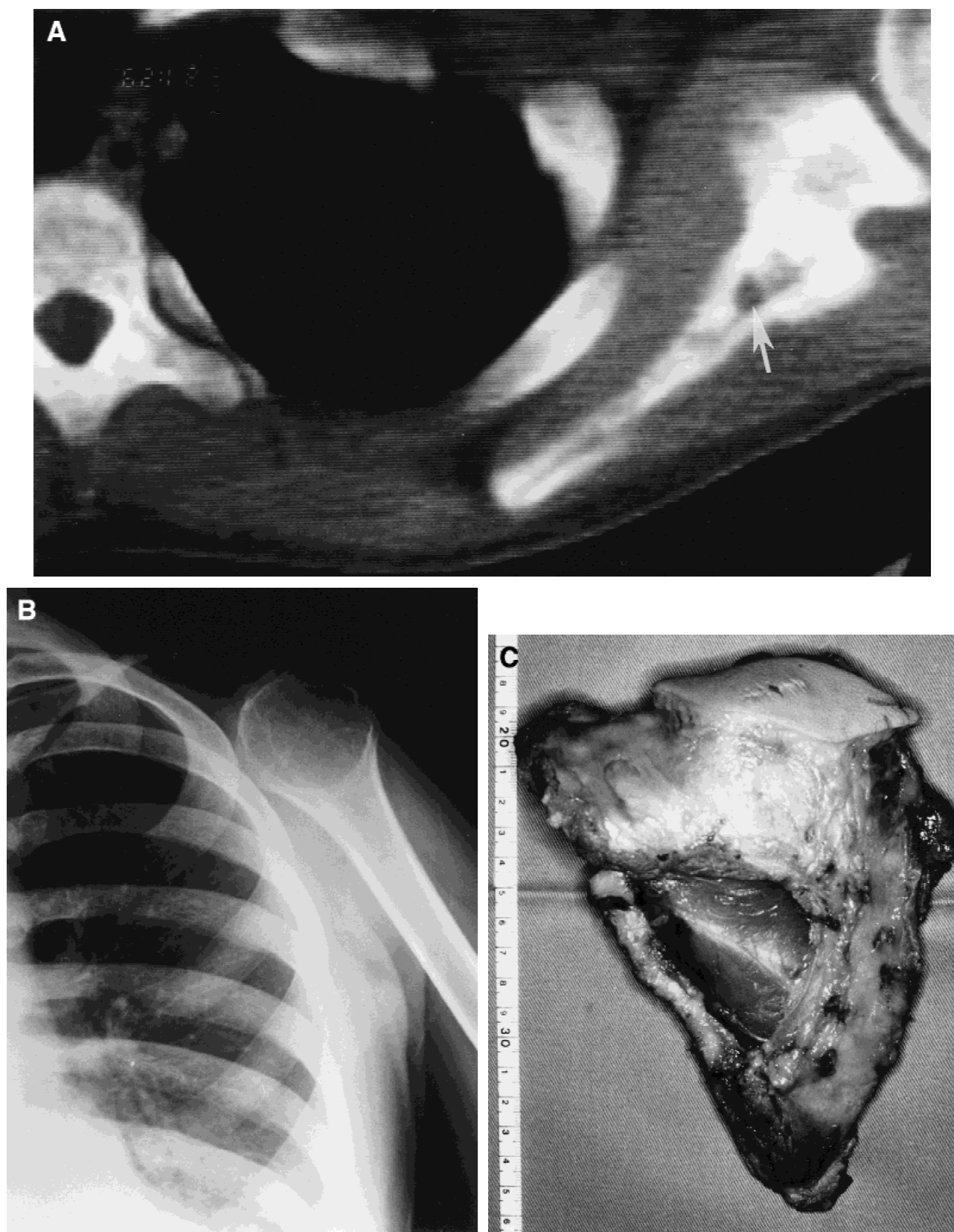


Fig. 3. Case 1. **A:** Computed tomographic scan. Arrow = tumor invasion into scapula. **B:** Postoperative radiograph. **C:** Resected tumor from total scapulectomy.

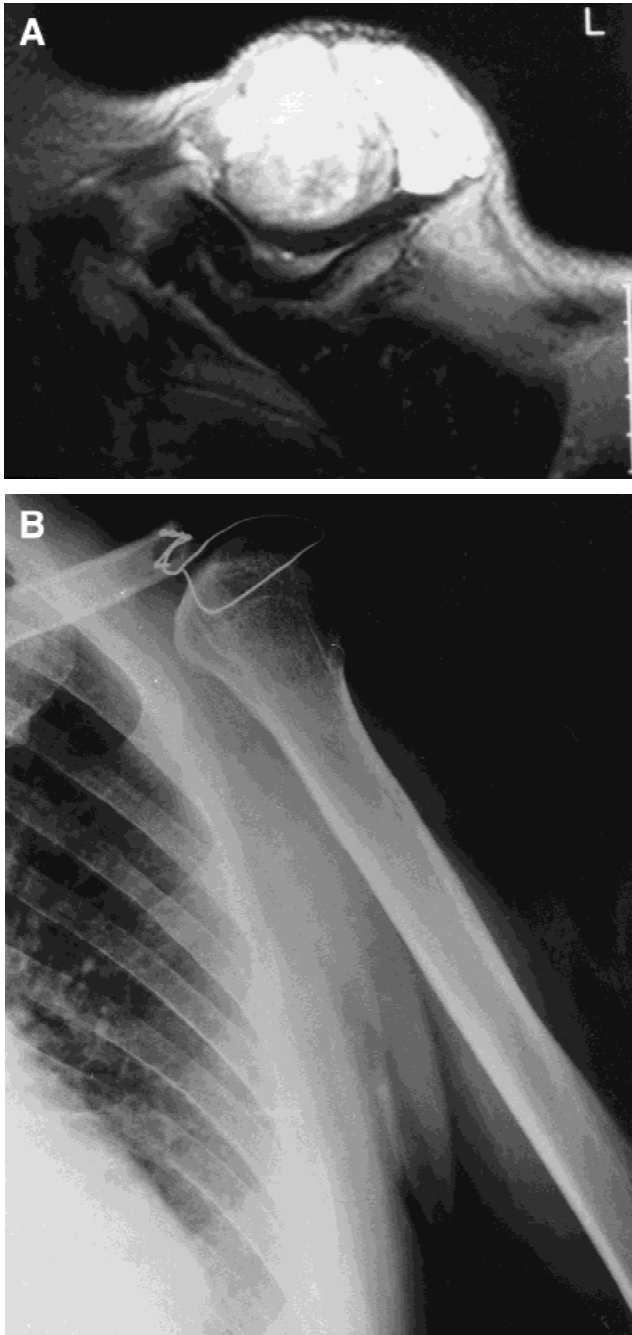


Fig. 4. Case 5. **A:** Magnetic resonance image of leiomyosarcoma invading the scapula. **B:** Postoperative radiograph. In this case, a wire was used for augmentation of soft-tissue reattachment to the clavicle.

or arthrodesis to the clavicle. The hanging procedure is less complex than arthrodesis. Recently, we have used a bone-anchoring system to suture between the clavicle and muscles, including the biceps, triceps, and deltoid muscles. This system is easy to use and effective for rigid reattachment of soft tissue to the bone. Although the shoulder function after total scapulectomy remained inadequate, we concluded that patients who undergo total scapulectomy can achieve much better function of the upper limb than those who undergo forequarter amputation (interscapulothoracic amputation) or the Tikhoff-Linberg procedure (interscapulothoracic resection).

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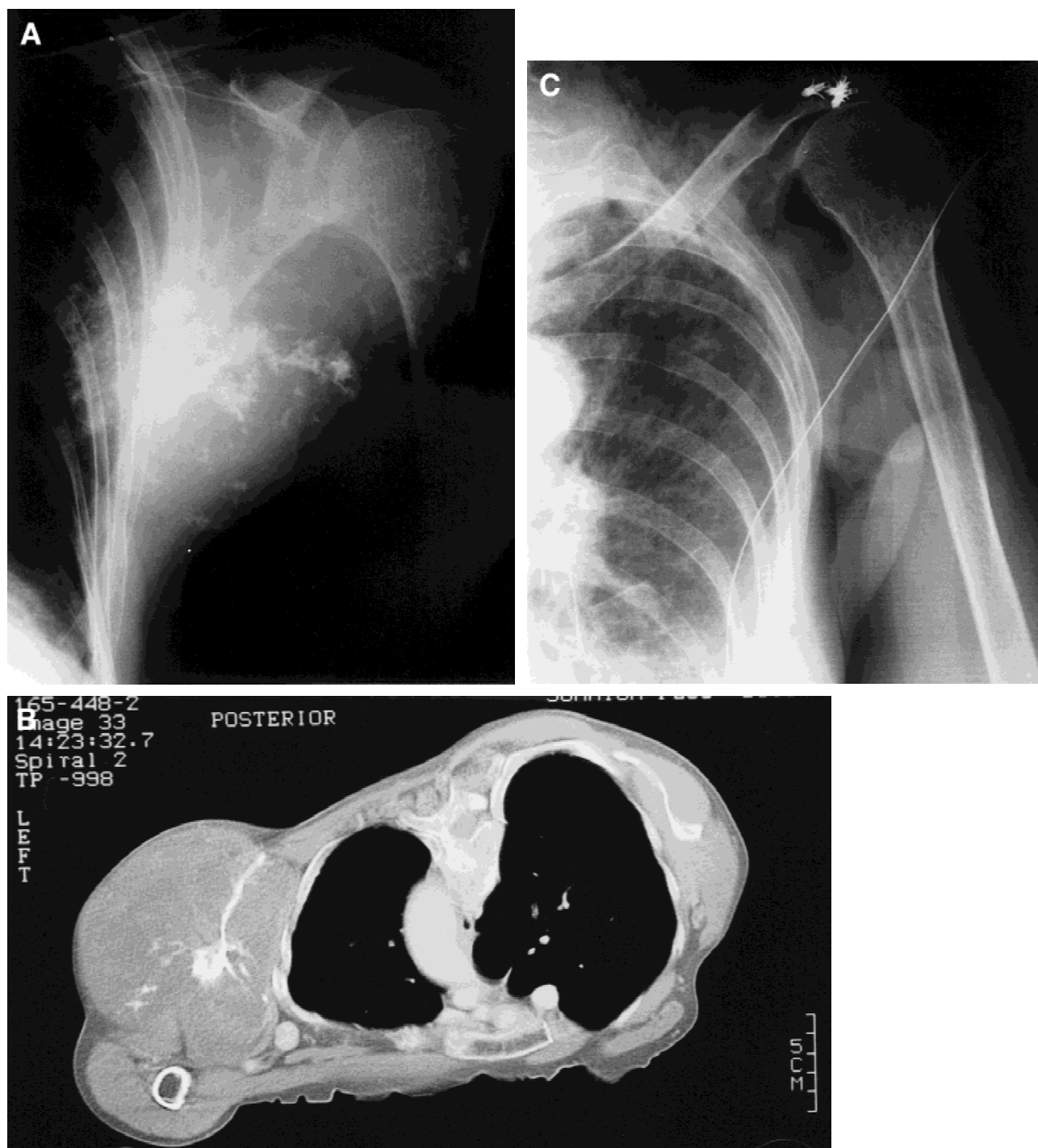


Fig. 5. Case 9. **A:** Preoperative radiograph of chondrosarcoma involving the entire scapula. **B:** Computed tomographic scan. **C:** Postoperative radiograph. In this case, an anchor system was used for augmentation of soft-tissue reattachment to the clavicle.

TABLE I. Functional Evaluation of 10 Cases of Total Scapulectomy\*

Case no.	Age/sex	Pathology	Pain	Function	Emotional acceptance	Hand positioning	Manual dexterity	Lifting ability	Overall rate (%)	Follow-up period	Prognosis
1	13/F	Leio	5	3	4	1	5	3	70	13Y 5Mo	NED
2	37/M	Lym	4	2	4	1	5	2	60	4Y 4Mo	DOOD
3	68/F	CS	4	3	4	0	5	3	63	6Y 9Mo	CDF
4	81/F	CS	4	3	4	0	5	3	63	1Y 2Mo	DOOD
5	61/M	Leio	5	3	3	0	5	3	63	8Mo	DOOD
6	12/M	Leio	5	3	4	0	5	3	67	3Y 7Mo	CDF
7	82/F	MFH	4	3	4	0	5	2	60	3Y 6Mo	CDF
8	70/M	MFH	5	3	4	0	5	3	67	3Y 1Mo	CDF
9	72/F	CS	5	3	3	0	5	3	63	2Y 9Mo	CDF
10	45/F	CS	5	3	4	1	5	3	70	1Y 1Mo	CDF

\*Leio, leiomyosarcoma; Lym, malignant lymphoma; CS, chondrosarcoma; CDF, continuous disease-free; MFH, malignant fibrous histiocytoma; NED, no evidence of disease; DOOD, died of other disease; Y, years; Mo, months; M, male; F, female.